In January last the rookery was again looked at, but had not been used. Thinking matters over, I came to the conclusion that the Cormorants must have been influenced either by the drought prevailing or disturbed by our visits, and probably retreated to the more distant rookery. Some of the pairs nested somewhere, for young birds were seen with the older birds in May. Weather conditions are more favourable this year, and I hope to be able to publish in a future issue of *The Emu* details and illustrations of their nests, eggs, and young.

The Admission of Colour-Genera.

BY GREGORY M. MATHEWS, F.R.S.E., R.A.O.U., &c.

ON the 10th February, 1915, a discussion was held at the meeting of the British Ornithologists' Club under the title, "Coloration as a Factor in Family and Generic Differentiation." The meeting was memorable, as by means of it we have now on record the views of leading British ornithologists with regard to a matter much and unreasonably neglected. I allude to the differentiation of species of birds into groups which will show their natural affinities. The members of this Union will have little opportunity of studying the B.O.C. Bulletin, and only a few will see *The Ibis*, where, in the April number, a detailed account of Dr. Lowe's remarks appears. I have, therefore, thought that it would be of interest to review that meeting and also give some Australian examples relative to the subject.

Dr. Percy R. Lowe opened the discussion,* and immediately

* The editors, in order that readers will have a better idea of Dr. Lowe's paper, have added several footnotes, including four extracts from Dr. Lowe's paper, which opened as follows :—

"I should like to state at once that in the few remarks which I propose to make on the subject of to-night's discussion, it is no part of my plan to attempt in any way to upset the established characters and methods which are employed in generic differentiation or to substitute for these some brand-new scheme based on colour-characters. Such a proceeding would be both futile and foolish. All I wish to accentuate is this—that colour-pattern seems to be a very important feature in generic differentiation, which has been, I cannot help thinking, unnecessarily neglected, looked down upon, or ignored. I believe not only that colour-pattern furnishes, in many instances, an important clue to the phylogenetic relationships of various groups of species, but that it would, if properly applied, enable us to get a practical and working idea of the limits of genera.

"I believe, in a word, that the employment of the factor of colour-pattern in generic differentiation would act, in many instances, in the way, so to speak, of a control experiment by which we might either substantiate or correct previous estimates of generic groups which have been based on such characters as are usually employed.

"Applied in a systematic way to all the genera which exist at the present time throughout the whole class of birds, I cannot help thinking that many of these genera would be found either to include too many species or too few.

"Finally, I do not for one moment hold the view that this factor can be universally applied to all genera, or anything like all; but where it can be used with good results, I can see no possible reason why it should not be applied—and applied, moreover, without fear of laying ourselves open to the charge of mere amateurism."

made good his cause by pointing out that colour-pattern was the basis of his theme, and not mere coloration. It turned out afterward that those who had intended to oppose him had not studied the subject, but were merely going to cite cases of abnormal coloration as a reason for the rejection of colour as a generic differential character. I would explain here that colour-pattern, as opposed to mere coloration, can best be understood by the citation of an example, and that Dr. Lowe at once did by making use of the Ringed Plovers. It is interesting to see that Dr. Lowe selected as his most prominent example the group I studied and commented on in my "Birds of Australia." It is still more pleasing to have to record that, from an independent study of this group, Dr. Lowe practically confirmed all my results. I studied this group from the external features of the bird's skin —viz., bill, coloration, legs and feet structure, and egg-coloration, using all these features in conjunction. Dr. Lowe attacked them from coloration, colour-pattern, and colour of juvenile from nestling to adult. He showed that the coloration of this group practically varied very little, whether the birds lived in the Arctic or sub-Arctic or in Austral or Neozelandic climes. The coloration of nestlings varied only in shade, the pattern showing practically no change. The young were very similar, and throughout all the species a constant style of coloration was observed. As a special example of how strongly this coloration was marked, Dr. Lowe cited the following :—"One of them [practical uses of nestling coloration, &c.] was the nestling of *Elseyornis melanops*, of Australia. In almost all works this form was always included at the end of the list of species belonging to the Ringed Plover group (*Ægialitis*). The nestling specimen exhibited undoubtedly proved, once and for all, that if *melanops* was indeed a Ringed Plover, it was a very aberrant form, and one which fully deserved the generic distinction that had been bestowed upon it."

I would emphasize that Dr. Lowe's results were achieved quite independently of my own, and hence the great value of such a confirmation. Dr. Lowe then showed some nestling Ducks, indicating that *Glaucium* and *Nyroca* were abundantly distinct, though they had been lumped by Messrs. Hartert, Witherby, Jourdain, and Ticehurst in their recent "Hand-list of British Birds."* This action in displaying the evidence before the Club has had its effect, and the above-mentioned authors now accept the separation of these two genera. If all the evidence in favour

* Dr. Lowe said :—". . . . demonstrating to you how impossible it would seem to unite *Glaucion* and *Nyroca* under one genus, as has been recently done, or, on the other hand, to include the Ruddy Sheld-Duck in a genus (*Casarca*) distinct from *Tadorna*, since the colour-pattern characteristic of the nestling plumage of the Ruddy Sheld-Duck is identical with that of the Common Sheld-Duck." Mr. Mathews not only recognized *Casarca* and *Tadorna*, but he divided *Radjah* from *Tadorna* ("Birds of Australia," vol. iv., p. 73), thus making three genera where Dr. Lowe would make one. —EDS.

of generic differentiation were as faithfully adjudicated upon there would be few genus-lumpers left. I would digress here to explain my own position, and would quote what I said at this meeting :—" I am compelled to side with those who maintain that colour must be utilized in the differentiation of generic groups, and am confident that this view will latterly prevail universally. I say this with confidence, as I was first influenced by the view of the professed adherents of the so-called ' structural ' school, and my first ' List of the Birds of Australia ' was prepared with that view as my basis. During its preparation I was being continually impressed with the inadequacy of the structure of a bird as a clue to its generic affinity, and, later, a monographic study of the Petrels compelled the rejection of that fallacy, as I soon realized that even in the mind of those who counselled the usage of structural characters *alone* colour was often the chief factor consulted. Study of colour evolution from the nestling to the adult, and the recognition of colour-genera, would certainly obviate many anomalies in the Australian avifauna, as is to be found, for instance, in the genus *Pachycephala* of authors, if it did not altogether prevent them. The latter result would be achieved if careful study of the birds was undertaken, and attempts to group them by means of colour were made at the time of the introduction into the genus of each new form. It should always be remembered that the available ' structural ' parts of a bird-skin are, comparatively speaking, trivial and unreliable, as these are more liable to variation by wear and tear than is the colour-pattern of the feathering of a bird."

It will be remembered that I once wrote strongly upon the subject of " genus lumping," and my conversion is simply due to detailed study of various groups. I will hereafter give *Pachycephala* as an example, but would note that, without restriction by means of colour, this genus covers the most peculiar assortment of forms, and anything from the Austral-Malayan region may be here referred with a certain degree of surety. Members of *Pachycephala, sensu lat.*, now figure in *distinct families*, widely separated.

To revert to Dr. Lowe's statements, he showed :—" We find that certain distinctive colour-schemes are characteristic and proper to certain families or genera of birds, quite irrespective of the fact that such groups of birds are exposed to *precisely similar environment.*" This is evident when we examine any collection made in any locality where varied colours are met with. Many of these coloured birds seem to show designs with no useful purpose—*i.e.*, greenish Honey-eaters might be supposed to be protectively coloured and brownish ground-birds be similarly situated ; but how does the brilliant coloration of the Superb Warbler* help it ? Such studies can be carried out by any Australian ornithologist, and the results of careful observation would

* The bright colours of the male Superb Warblers are usually explained by Darwin's theory of sexual selection. They are generally seen close to cover.—EDS.

really be as useful, if not more so, than simple records of the bird inhabitants of, and visitors to, a place, or egg-collecting. I do not wish to belittle either, as both are most necessary for the advancement of ornithological study, but there are many other lines which are at present neglected. Thus, study of the habits of birds in the bush, their actions and methods of living, would be most valuable. I have suggested that ecological study of bird-life will later become popular, and once again advocate its study. Dr. Lowe's essay, if it had done nothing else, must have impressed upon British ornithologists the value of the study of nestlings. However the older school may view this subject, the younger British school is taking a great interest in it, and if Australian ornithologists wish to lead the van, here as in other places, they would be well advised to begin in this direction at once. I would again divert to point out that, though Dr. Lowe did not introduce into this essay any remarks *re* egg-coloration, I believe that he has been confirmed as to their value in the order *Charadriiformes* exactly as I was, and here an Australian, Mr. A. J. Campbell,* furnished a valuable contribution, which I have previously acknowledged as being of practical use in generic differentiation. I am certain practical observations on nestlings by Australians would prove as valuable.

Many of Dr. Lowe's examples are so foreign to Australians that I forbear quotation, but when I deal with *Pachycephala* I will make reference to Dr. Lowe's remarks. His essay, as it appears in *The Ibis*,† is divided into eight heads, which I will cite :—

1. *The distinction which must be made between "colour-pattern" and mere coloration.*

I have already pointed out that this practically killed all discussion, as the difference was unknown to non-students of *colour-pattern*,‡ and the remarks made by each member emphasized this, as will be later noted.

2. *The question of concealing coloration.*

Dr. Lowe remarked that this theory has been much overworked, and made a good case for only considering it as of secondary importance. He quoted a good instance, and I feel

* *Emu*, vol. iii., pp. 168–171.

† April, 1915, pp. 320–346.

‡ Dr. Lowe explained the difference as follows :—"Colour-pattern (that is to say, a certain definite and more or less constant relation of colour-factors to certain definite areas of the contour-plumage, occurring through a series of species or genera) implies something of a deeper import than mere coloration—something which from its constancy and persistency, its independence of mere environmental or climatic influences, and its correlation with faunal or geographic areas appears to undoubtedly suggest the influence of the germ-plasm. If this is so, it obviously follows that the factor of colour-pattern must be of genetic importance. It is heritable. It ought to be, as I believe in many cases it is, a useful phylogenetic guide or clue. Mere coloration, on the other hand, may, I suggest, be regarded as somewhat akin to mere homoplastic variations or convergent adaptations in the deeper realms of morphology. Regarded in this sense, mere coloration of this kind is of no genetic value."

certain Australian Parrots would show similarity, thus:—"The Trogon peculiar to Cuba, for instance, is in reality a very conspicuously-coloured bird; yet I have found it at times very difficult to find in the forests, although I happened to know that I was within a few yards of one from having heard its peculiar Pheasant-like cry. The reason for this was that the brilliant scarlet of its under parts was apparently confused with the scarlet inflorescence of certain arboreal and parasitic plants which were common. The Trogon had, in fact, unconsciously 'adapted itself' to its scarlet-tinted surroundings; for it is to me quite an unthinkable proposition to suppose that these scarlet-coloured epiphytes could by any conceivable means have so affected the germ-cells of these Trogons that they were induced to respond in sympathy with their environment. Yet this is exactly what we are often asked to believe. On the contrary, the germ-cell produced the scarlet area, and the Trogon has made, so to speak, the best of a bad job."

Dr. Lowe's view seems very acceptable, and Australians might investigate the habitats of some of the highly-coloured Parrots,* Superb Warblers, Sanguineous Honey-eater, &c. The result of such studies would be well worthy of publication, and no "slaughter" of bird-life is required at all in such pursuits.

3. *The constancy and persistence of colour-pattern.*

Dr. Lowe's examples were Ringed Plovers, East Indian Cuckoos, and South American Caciques. My example of *Pachycephala* will show this well.

4. *The correlation of colour-pattern with geographical or faunal areas.*

Dr. Lowe cited the genus *Cæreba*, which he had previously thoroughly studied, and then added examples I have already commented upon, the Stone-Curlews, and Oyster-catchers. Here again Dr. Lowe showed nestlings, while I laid stress upon adult coloration. The fact that the adults were so similarly coloured, while in the former case structural differences had been evolved, was not noticed by Dr. Lowe, so that here again we have strong confirmation by independent workers, *when such deal with a subject without prejudice.* For the bane of British ornithology for the last thirty years has been prejudice. This is clearly seen from the writings alone of British workers, and now such prejudice is being overcome, and I anticipate better work in the next thirty years.†

5. *The correlation of colour-pattern to sex.*

The fact that the male is often more brightly coloured than the female was put forward as a difficulty which lessens the value

* At the R.A.O.U. Warunda camp-out, Eyre Peninsula, South Australia, in 1909, the Blue Mountain Parrots, "'noble birds, gorgeously apparelled,' . . . keenly and noisily resented our curiosity, and screeched much as we tried to discover them amongst the green foliage. Though so gaudy, they were picked out with difficulty."—"An Australian Bird Book," 1911, p. 90.

† Mr. Mathews is alone responsible for personal opinions expressed in different parts of this paper.—EDS.

of colour-pattern. I will deal with this under my example *Pachycephala*.

6. *The correlation of colour-pattern with other generic characters.*

Dr. Lowe stated that this was self-evident from an examination of any group, and I would endorse this.

7. *Colour-pattern as a phylogenetic clue.*

Dr. Lowe here showed a diagram of an attempt to indicate the phylogenetic relationships of the whole group of Waders.* This diagram was based upon a study of the nestlings, using colour-pattern, as shown by those, as a main feature, and proved conclusively that study of the nestling absolutely disposed of many debatable points in former classifications when such were not made use of. Dr. Lowe made the following most interesting announcement :—" In attempting to construct this 'family tree,' which purports to depict the phylogenetic relationships of the whole sub-order of Waders, a study of the osteological characters of this group has been carried on simultaneously with a study of the nestling young (not to mention other aids to classification), the result being that these two aids to the whole question of phylogeny have illuminated one another in the most interesting way." I now await the publication of his essay, which will be the most complete on these birds yet made, and I believe, from conversations with Dr. Lowe, that my conclusions in the " Birds of Australia," which emanated from the study of Austral forms only, will be mainly upheld by a complete monographic study of the whole group.

8. *The relationship of colour-pattern to the question of genera-splitting or genera-lumping.*

Under this heading Dr. Lowe initiated a movement quite novel to British ornithologists, but which I have indicated as being the next to be approached—viz., the usage of " super-genera." His remarks very nearly coincide with my actions, and I hope to utilize super-genera in the future when nestlings and series are available to indicate such correctly. My example of *Pachycephala* will show why the proposal of super-genera must be withheld for a while yet.

Dr. Lowe's remarks are worthy of reproduction *in toto*,† but I must content myself with his concluding sentences :—

" The obvious or logical conclusion, therefore, is that we ought more often to make use of super-genera by way of expressing or

* Unfortunately, Dr. Lowe's valuable and interesting article in *The Ibis* does not contain the diagrams or any summary of his results.—EDS.

† The following passages regarding " monotypic " genera are especially worthy of consideration :—" As things are now, in by far the larger number of cases, genera are purely artificial, arbitrary, and non-natural ‡ groups which have been constructed for our convenience. They have, in fact,

‡ In the discussion which followed the reading of this paper, much was made of the idea that genera were non-natural, man-made, and purely convenient groups. If, however, the units (species) of which genera are composed are natural, nature-made units, surely groups comprised of such units ought to be natural if only such units are properly assorted. If genera are not natural (and there is no question that many of them are not), that is the fault of those who created them—not Nature's. Personally I believe in groups of species which are generally allied—that is to say, I believe that Mr. Iredale struck the right note when he said that genera were or ought to be as natural as species. (Author's footnote.)

emphasizing the near phylogenetic relationships of groups of genera. That any real progress in this direction is retarded or rendered practically impossible is due to the fact that at present it is only on very rare occasions, and quite sporadically, that we find nestlings or immature examples of species represented in our collections. Finally, if colour-pattern is going to be applied as a generic factor on anything like a large scale, it will, I am afraid, be found necessary to create many more genera or sub-genera than exist now. But why not, if and so long as these genera or sub-genera were found to be natural groups, corresponding, as I have found in many instances they do, with faunal areas or geographical regions or sub-regions ; and if and so long as such sub-genera or genera are integrated into large natural groups, genetic phyla, or whatever term is employed, so that we may be aware of their natural relationships ? These minor groups of birds are not like stamps, which are to be arranged methodically in an album. We have not finished with them when we have cleverly elaborated a system which ensures that we shall know exactly where to find them in the cabinets of a museum. On the contrary, they are natural groups of organic creations, with independent or particular areas of distribution, and doubtless with independent ecological life-stories."

been constructed in order to simplify and codify our general concept of any particular family of birds. Unfortunately, unless we simultaneously employ some method of integrating minor generic groups into larger and naturally constructed super-generic phyla, there seems to be a danger that, in the multiplication of genera which is now going on, our concept will be—not simplified, but complicated and obscured. For all practical purposes, we shall, in fact, have arrived by a laborious and painstaking process at the exact position from which we originally set forth. We shall indeed have been perambulating a circle ; for we have only got to imagine the process of genera-splitting carried a few more steps further on and we shall have arrived at such a pass that all genera will have become *monotypic*. This may seem to be an exaggerated picture of the position, but if colour-pattern is really and truthfully ignored in generic classification—as systematists assure us—a flood of monotypic * and quite artificial genera is not an unlikely eventuality, so fine are the distinctions now drawn between trivial variations in the structure of the bill and other organs. If, on the other hand, colour-pattern is not ignored, genera-splitting is far less likely to do harm, and indeed is likely to be productive of much good, for we shall have got down to small groups of natural and genetically related species. These minor generic groups would, in fact, in most cases be found to consist of analytical varieties grouped around some central or dominant specific type. They would be really natural units which, when integrated with others into larger and still natural groups (super-genera or what not), would express at a glance the phylogenetic natural relationships of the particular family or sub-family we were dealing with. My point, therefore, is that, while disintegrating within justifiable and natural limits, we should at the same time integrate on the above lines. Take, for example, the Redshank association again. In this group, so variable are the structural features of the bill and other anatomical features, that almost every species could conceivably be made the type of a distinct genus ; and the same might be said of the Dunlin association. Colour-pattern saves the situation."†

* At least three-quarters of Mr. Mathews' genera of Australian birds are at present *monotypic*. —EDS.

† Mr. Mathews' 1913 list shows 50 species of the Wader order, divided into 46 genera Forty-two of these contain one Australian species each, and four contain two species each. The B.O.U. list contains 64 species in 31 genera. Dr. Lowe's numbers are, unfortunately, not available here.—EDS.

I agree exactly with the preceding remarks, as will be well known to readers of my "Birds of Australia" and those who have watched the evolution of my "List of the Birds of Australia."

I will now give details of the discussion. Mr. W. P. Pycraft had been cited as opposing Dr. Lowe, as it was through a criticism made by him that the evening discussion was initiated. However, he at once repudiated his writings by stating, "In the main I agree with Dr. Lowe," and confirmed this with the following admission :—"A little time ago I had occasion to write part of a book on British birds, and I had to write hurriedly. As a consequence, in the concluding chapters, wherein I summed up my remarks on classification, I find I did not express myself at sufficient length to carry exactly the meaning I had intended to convey. I stated there that it was impossible, without juggling with facts, to recognize the genus *Ægialitis*, which should be included in the genus *Charadrius*, and, further, that colour was a factor which must be ignored when forming *genera*, if classification was to be framed on sound scientific lines." He followed up his conversion with the further illuminating remarks :—"I certainly agree that coloration is an extremely important factor in classification, and one that has been far too much neglected." Of course, this contradiction of his former written attitude practically annulled all discussion, as he was supposed to have facts to support his statements, whereas he absolutely abandoned any opposition. He then remarked how the changes from winter to summer plumage and the differences between male and female complicated the usage of colour, at once showing that he had not grasped Dr. Lowe's distinction between mere coloration and colour-pattern.

Mr. Pycraft also confirmed Dr. Lowe's essay by stating :—"If . . . . our classification is to express the genetic relationship between different groups, then we have to follow sometimes colour, sometimes some other character." His remarks about coloration throughout showed that he altogether confused coloration and colour-pattern, and, in view of his frank admission that his statement that colour must be ignored in the formation of genera was absolutely wrong, little notice may be taken of his further statements. He said, later, that "More interest must be taken in the deeper characters ; first of all must come the skeleton, as being perhaps the most tangible part you can get. The characters furnished by this should form the basis of the larger groups and families, and the generic groups should rest on the same basis. . . . All the earlier naturalists placed the Owls with the Birds of Prey. But an investigation into their anatomy has shown that the Owls have nothing whatever to do with the Birds of Prey."

Pycraft himself wrote (*Proc. Zool. Soc. Lond.*, 1902, pp. 3, 4) —"On osteological evidence alone, however, it is doubtful whether the *Striges* would ever have been separated from the *Accipitres*." Consequently, the skeleton is not such a sure guide as is suggested

in the above remarks. While it is impossible to utilize skeletal characters as of generic value as a general rule, in some cases genera show differences in the skeleton. In the majority of cases, however, no tangible difference can be seen in the skeletons of admitted closely-allied genera, while in the Passerine groups even families are not well individualized as regards the skeleton.

The Hon. W. L. (now Lord) Rothschild began :—" Personally, I am not entirely in sympathy with either Dr. Lowe or Mr. Pycraft. However, if I may be permitted to say so, I cannot agree that the question of genera is of such importance from the point of view of ornithology as many of us would make out. I quite admit that species as we see them to-day are the work of evolution and of Nature, but the idea of genera is a purely human invention. . . . The classification ought to be carried out, as far as possible, on phylogenetic and evolutionary lines, as suggested by Mr. Pycraft, but I think genera ought to be subordinated to usefulness. . . ."

Herein are well expressed the views of a clever ornithologist, who has never studied higher classification, because, if species are the work of Nature, all the higher groups must be, and genera must be more than, a " purely human invention." If this were admitted, why should not colour be more commonly used, as colour-genera would be easily manipulated if they were simply constituted by means of colour without reference to form. If classification is to be carried out on phylogenetic lines, how can genera be best gauged as to their usefulness ? Simply by the way they show phylogenetic alliances, and this is admitted to be governed in many cases by colour-pattern.

Mr. Ogilvie-Grant confirmed this view by his remarks :—" Genera, as we all know, are purely arbitrary divisions, which we use in grouping together allied species and sub-species, so that we may be able to deal with them more conveniently in classification. . . . Genera do not exist in Nature. . . . The deeper-seated characters should be reserved for the differentiation of families and sub-families, not genera, and should be used to link up and associate the latter in a natural manner. In this respect I think Mr. Pycraft has somewhat confused the issue." Though he deliberately stated that " genera do not exist in Nature," he argued that " Linnets and Goldfinches appear to me to be clearly-defined and natural genera "—two remarks clearly showing the confusion in his mind as to what were genera. His method may be gauged by his statement—" The more experience we have in dealing with the class Aves generally the better we shall be able to decide *instinctively* what constitutes a genus." The italics are mine. I do not think " instinct " can be resorted to for classification, notwithstanding the high authority of Mr. Ogilvie-Grant.

Mr. W. L. Sclater's views were of most value, as they really cover all that can be said save the idea that genera are purely artificial. Thus :—" I think genera are a matter of convenience

more than anything else, and a genus is entirely a human conception, and does not exist in Nature at all; it is purely artificial. We can probably define a species and a sub-species, but a genus is merely a number of species put together for our own convenience. As regards Dr. Lowe's views that generic characters should be based on colour-pattern, I must say I agree with him. I think colour-pattern is often a very ancient and deep-seated character, and obviously colour-pattern must be a much more primitive character than the relative lengths of the tarsus and the middle toe, or the relative width and length of the bill. These characters are easily modified by external circumstances, and you cannot regard these characters as more deep-seated than colour-pattern."

Dr. Hartert stated:—"I did not intend to take part in this discussion, but it interests me so much that I cannot help saying a few words. I am very glad, and must express my great satisfaction, that the general trend seems to my own view—*i.e.*, that genera are artificially made by ornithologists, and that Nature does not classify its species into genera. Nature made species and sub-species; genera are made by man for convenience. I agree, on the whole, with Mr. Pycraft, that the more 'deep-seated' characters should be taken to distinguish genera." He continued by citing examples of similar coloration in different groups as a reason for opposing the usage of colour-pattern, but he so absolutely confused mere coloration with colour-pattern that his citations do not correlate with the facts—*i.e.*, "The weakness of colour-pattern as a generic character is also shown by the different coloration of adult and young in ever so many instances, where we have the young birds quite differently marked from the adults." To any student of evolution it is well known that the young show the primitive coloration and colour-pattern; that the process of evolution can be seen to some extent by the change from the immature to the adult, and commonly from the adult female to the adult male, which is generally the most highly coloured and ornamented. The fact that adults differ in coloration does not negative the value of colour-pattern, but emphasizes it, as I hope to show later. As Dr. Hartert is strongly opposed to the recognition of colour, while all the previous speakers had admitted it, his satisfaction must be confined to the artificiality of genera as above quoted. I, however, can never understand that argument, for, if genera are purely artificial, why argue about the use of coloration in discriminating such? An artificial classification would surely grasp colour as being a most suitable means of differentiation, and then use structure when the colours became confusing.

The further speakers at the meeting were all in favour of the usage of colour-pattern, and it was practically a unanimous victory in favour of Dr. Lowe. Those who had ventured to oppose his well-considered essay mostly showed their ignorance of the higher conceptions of the subject.

I have stated I would cite *Pachycephala* as a good subject, close at hand to Australians, whereby most of Dr. Lowe's points could be brought directly into review. This typically Australian "genus" extends over New Guinea, the Moluccan Islands, eastward to Fiji, New Caledonia, but not New Zealand. We have here a "genus" with a defined geographical range agreeing with boundaries limited through the result of studies in other branches of science, including botany and geology. It is a Passerine genus, therefore one which, from the evolutionist view-point, would be a most difficult one to limit by means of colour-pattern. Yet we see a peculiar type of coloration evident in a most decided manner, and here we also see a colour-pattern which is not governed by any one colour, but is present when the colours are re-arranged and altered, and this is where the distinction between colour-pattern and mere coloration is emphasized.

Collect together male, female, and immature of *Pachycephala temporalis*, *rufiventris*, *gilbertii*, *lanioides*, and *olivacea*. We will, for the time, ignore all structural differences, and glance at these from the point of coloration alone. All the young and the females have a similar appearance, varying in particular coloration. The males, however, are somewhat strikingly different, *but each shows a more or less distinct throat patch.* In *olivacea* the throat is indistinctly marked as a whitish patch, freckled with brown, rather agreeing with the general throat coloration of the females of all the species. In general hue, the male in this species agrees with the female, and from an evolutionary view-point this would be suggested as the oldest form, the one in which the male retained the dull plumage of the female and immature. Peculiarly enough, the Norfolk Island form has done the same thing in an even more marked manner, as it has scarcely varied at all from the universal female type, whereas *olivacea* does show a variation. Now, while the female of *temporalis* is content to retain the original plumage, the male has evolved a gorgeous green, yellow, and black coloration. The head is black, as is a broad pectoral band enclosing a pure white throat, while the rest of the underneath parts is bright yellow, this colour also forming a nuchal collar; the back is olive, the wings and tail blackish. I will revert to the forms of this shortly. When we pick up the male of *rufiventris* we see exactly the same colour-pattern,* but with no colour the same save the head, throat, and pectoral collar; the under parts are pale reddish-brown, while the upper are grey. The species known as *gilbertii* does not show the black pectoral collar, but has the throat red, followed by a greyish band, and the grey abdomen tinged with rufous. It is grey above. The rare bird *lanioides* has the white throat surrounded by a black band, the under surface white, and the head black.

* As the "colour-pattern" is "exactly the same," how does Mr. Mathews justify his placing these two species in two genera of one species each? Mathews' 1913 list places seven Australian species of *Pachycephala* (used in its restricted sense) in seven "monotypic genera."—EDS.

Now, though so different in coloration, there is a determinate family resemblance in the colour-pattern of all these birds, and that peculiar white or coloured throat patch is remarkably constant. Since we see here a variation in coloration from *olivacea* to *temporalis*, with apparently little structural alteration, the genus-lumpers used this group as a dumping-ground for any Austral species, and, as recognized now by Rothschild and Hartert, the genus is heterogeneous and polyphyletic, and birds properly referable to other families have been classed here. The migration backwards and forwards of *Eopsaltria* and the species referred to it will be familiar to my readers. Dr. Lowe quoted another instance. One bird referred to *Pœcilodryas* has been transferred to *Saxicola*, while another proves to be the female of a form of *Pachycephala* * *temporalis*. He suggests study of colour-pattern indicated these emendations.

Dr. Hartert referred another bird to *Pachycephala*, which Dr. Ramsay described as an *Eopsaltria* (?), from its colour-pattern. I concluded it could not be classed in either, and Dr. Macgillivray, from a study of the living bird, endorsed my conclusion. The persistence of the colour-pattern is evidenced by the cases of *P. temporalis* and *rufiventris*, where a distinct coloration is seen combined with an identical colour-pattern. There is an extra-limital group about *P. kebirensis*, Meyer, from Roma Island, Moluccas, which has also retained exactly the colour-pattern, but is a grey bird with white underneath instead of yellow or reddish.

As noted above, we are dealing now with a group high in the scale of evolution, and one showing quick changes both in male, female, and young. The fact, then, that a well-marked colour-pattern can be seen through so many changes is very remarkable, and the birds coloured like *P. temporalis* can be cited as furnishing a most thoughtful group. The variation of *P. temporalis* throughout Australia has been expressed by the description of many sub-specific forms, but the change in coloration is comparatively slight, being most easily seen in the tail coloration. The shades in the female coloration, however, can be distinguished in some cases. Outside Australia, however, as the birds were isolated completely and different environmental stresses came into play, some new changes appear. A number show as little change in the male coloration as do the Australian forms, but the female shows proportionately a greater change. In New Caledonia, however, the female begins to evolve a male style of coloration, and in *P. littayei*, while the male agrees closely with that of *P. temporalis*, the female underneath has a pure white throat, followed by yellow, thus differing from the male in lacking the black pectoral collar. She has, however, not evolved a black head either.

As a variation away from the *temporalis*, we find *mentalis* in

* Dr. Lowe refers *Pachycephala* to the Shrike family, *Laniidæ*. Mr. Mathews and the R.A.O.U. refer it to the Flycatcher family, *Muscicapidæ*.

Ternate attaining a black chin, and in Tonga we see a most complex change, the throat in the male being all black, the rest of the under parts being yellow, the place of the black pectoral band being yellow; in the female the throat is white, a rusty-tinged pectoral band being followed by yellow underneath. In *P. astrolabei*, from the Solomon Islands, the male is practically as in *temporalis*, but the throat coloration is *bright yellow*, not white. On another of the Solomon group, a further melanistic change occurs; the birds called *P. melanota* have the black of the head extending over the whole of the upper parts, and the pectoral band broadened, and black patches appearing on the sides of the body. In the former the female shows a tendency to evolve into a yellowish underneath bird, which has come about in the latter, which has also evolved in a reddish direction on the head, wings, and pectoral band. On the Fiji Islands there is a form which has lost the black pectoral band while producing a yellow throat, and is now uniform yellow below, and, in addition, has evolved two yellow forehead spots. I would just like to note that another form, called *P. fulviventris*, while retaining the general colour-pattern, with a white throat, has produced a deep fulvous abdomen, &c., coloration.

This review may not be so easy to follow as it is when the birds are laid out for examination, but the existence of a definite colour-pattern in this group independent of colour is manifest by the existence side by side of *P. temporalis* and *rufiventris*. How the colours change in a complementary manner has been explained in the preceding cases, when we see the yellow predominating, the black predominating, and the fulvous new colour driving out the yellow. We have not the changes in existence as far as is yet known showing the alteration from *temporalis* to *rufiventris*.

It must be obvious now that there is a difference between coloration and colour-pattern as laid down by Dr. Lowe in section 1. The constancy of persistence of colour-pattern (Dr. Lowe's section 3) has been well demonstrated. The correlation of colour-pattern to sex (Dr. Lowe's section 5) must be recognized throughout the preceding remarks on *Pachycephala*, and the student will have noted how the colour-pattern is even evolved in the female in the case of *P. littayei*. The usage of super-genera must await the examination of suites of material, as here, apparently, we have a super-generic group of birds, which includes several generic groups which have not yet been determined.

An American Opinion Concerning Genera.—The following passage, taken from *The Auk* (the official publication of the American Ornithologists' Union), July, 1915, shows American thought concerning the difficult question of genera:—

"The question of the limits of genera bids fair to be the most serious problem in zoological nomenclature. In the recent 'List of British Birds' there are 171 species and 151 generic groups